3.0 PROJECT DESCRIPTION

3.1 INTRODUCTION

The section presents the details of the proposed Helios Energy Research Facility project (the Helios Facility or Helios project) in terms of the project objectives, the facility's various components and design features, the population associated with the proposed project, and construction schedule and activities.

The Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab) is proposing to construct an approximately 160,000-gross-square-foot (gsf),[1] 89-foot-high research facility that would accommodate two research programs focused on alternative and renewable energy sources: (1) the Helios research program, a collaborative effort between LBNL and University of California (UC) Berkeley that would conduct research to utilize sunlight to create efficient energy sources; and (2) the Energy Biosciences Institute (EBI), which is a grant-funded program through British Petroleum (BP) that would conduct research with BP partners, LBNL, UC Berkeley, and the University of Illinois, Urbana-Champaign (UIUC) focused primarily on renewable biofuels for transportation and conversion of heavy hydrocarbons to clean fuels. Once constructed, the facility would be operated and managed by UC Berkeley.

3.2 PROJECT OBJECTIVES

Key objectives of the proposed project are to:

- Provide an integrated and appropriately designed facility for high-level/advanced research in solar and other alternative energy sources and technologies;
- Create a facility that draws upon the intellectual, technological, and material resources of LBNL and UC Berkeley to support and stimulate research in developing sciences and technologies and that encourages the next scientific discovery;
- Co-locate different research programs in one facility to promote cross-pollination of ideas and theories and create a multi-disciplinary collaborative environment;
- Locate the facility such that researchers have convenient access to unique and top-rated scientific facilities and that duplication of facilities is avoided;
- Foster interaction and collaboration between the project, LBNL, and UC Berkeley researchers and students by locating the facility near the Laboratory's fence line; and

[1] This number is based on the conceptual design of the project. It is expected that when the final design is completed, the gross square footage of the proposed building would be smaller by about 10,000 square feet although the assignable space would be about the same as analyzed in this EIR.

- Create a facility that becomes a benchmark for energy-efficient usage for future similar building types.

3.3 PROJECT NEED

The goal of the Helios Facility project is to advance the science and enabling technologies needed to produce significant quantities of alternative, carbon-neutral fuels. This would serve both to reduce the dependence on fossil fuels and aid in the effort to halt or reverse global climate change. Currently, 80 to 85 percent of energy used around the world comes from fossil fuels. As a consequence, non-renewable fossil fuels are being depleted at high rates, making it imperative for humans to identify and develop new sources of energy. Furthermore, global use of fossil fuels has grown to the point where the by-products of energy consumption appear to be significantly affecting the earth's atmosphere and climate. Transportation is a major sector of the world economy that is highly dependent on fossil fuels and is a significant contributor of emissions that may be contributing substantially to global climate change. The proposed Helios Facility would house research that would explore ways to develop and improve the production of alternative fuels obtained from solar energy, other abundant materials such as carbon dioxide in the atmosphere, and biomass, focusing especially on those fuels that could be used as transportation fuel. The research would also investigate ways to convert heavy hydrocarbons to clean fuels, improve recovery from existing oil and gas fields, and remove excess carbon from the earth's atmosphere. Therefore, the research program included in the Helios Facility would approach the global climate change and energy problems from a number of different angles.

Because the Helios research program and EBI research program would share common objectives related to the development of efficient alternative fuel sources, it is beneficial to house both programs in the same building so as to share laboratory equipment where appropriate and to provide convenient access to unique scientific facilities such as the Molecular Foundry and the National Center for Electron Microscopy, which are located in the southeastern portion of LBNL, and the Advanced Light Source, a national user facility that attracts scientists from around the world. Moreover, siting the proposed building close to both LBNL and UC Berkeley would be advantageous because it would reduce the travel associated with the movement between the two institutions and between buildings at either institution and the research building. This building would house approximately 500 research scientists, administrative staff, and visitors. Among these, most senior scientists would have teaching assignments on the campus and/or association with other research groups on the campus or LBNL. There would be frequent trips between campus, LBNL, and this facility for seminars and classes. For these reasons, a site that is in close proximity to LBNL and a short bus shuttle ride to the campus represents an environmentally responsible location.

3.3.1 Helios Research Program Goals and Program Elements

The goal of the Helios research program is to develop the science and technology that would allow the conversion of sunlight to other energy forms. A primary goal of the research in this building would be to develop new carbon-neutral transportation fuels. Carbon-neutral fuels derived from plants and other photosynthetic organisms, or from an electrochemical transformation of water and carbon dioxide, are two routes to this goal. There are several fuels that could be produced from this research including known fuels, such as ethanol, methanol, and hydrocarbons; better burning fuels would also be researched. The electrochemical process would be powered by sunlight, and therefore, research into advanced photovoltaics (solar panels), storage of electrical energy, and development of chemical processes that mimic photosynthesis would be conducted.

The Helios research program would include the following research programs:

- **Nanoscale Photovoltaic and Electrochemical Systems Research.** This research would develop high-efficiency discrete individual nano-scale photovoltaic and electrochemical systems using abundant elements such as water and carbon dioxide (the latter taken from the atmosphere that has excess Carbon Dioxide (CO_2), with emphasis on materials that can be incorporated into the synthesis of complete solar fuel generators. New chemical processes, including complex new catalysts that may mimic those in nature, will be developed. This research would address major scientific barriers in solar fuel generation.

- **Synthesis of Complete Solar Fuel Generators.** This research would be directed towards new solar fuel generators that incorporate the photovoltaics and electrochemical processes described above and transform water and carbon dioxide to produce fuels with high energy density and with no constraint on abundance.

- **Photosysthesis Research in Natural Organisms.** The photosynthesis process would be studied to help design artificial systems of fuel generation described above.

- **Metabolic Research in Natural Organisms.** Related to natural systems of energy generation, the metabolic pathways in microorganisms would be studied to produce a variety of fuels and fuel additives.

3.3.2 EBI Goals and Research Program Elements

The goal of the EBI research program is to solve the scientific and technical problems associated with large-scale production of renewable biofuels for transportation, conversion of hydrocarbons to clean fuels, improved recovery from existing oil reservoirs, and carbon sequestration. The EBI would perform bioscience research aimed at increasing our understanding and potential application of biofuels to reduce the impact of energy consumption on the environment. Currently about 10 percent of the energy used in the world comes from biomass, however, the biomass; is not produced in a sustainable manner. One

purpose of the EBI research is to make improvements to the biofuel production process so that sustainable biofuels can account for a greater portion of energy used globally, without necessarily using large areas of arable land. There would be two components within EBI, the non-proprietary UC Berkeley and LBNL researchers and a small group of British Petroleum (BP) scientists in a separate, proprietary division. There would be six interrelated research programs within EBI.

- **Feedstock Development**, which is sustainable development of plant biomass in close proximity to a processing plant that converts biomass to fuel. The program would research development of biofuels from both crop residues and perennial energy crops in both tropical and temperate climates under different soil conditions so that the research benefits all areas of the world. This research program would be conducted both within the Helios Facility at LBNL and at the Open Air Feedstock Research and Development Center at UIUC. The laboratories within the Helios Facility would focus on biomass engineering; lignin; and biotic stress. Research programs focused on feedstock production, feedstock genetics and plant breeding, environmental impact and sustainability assessment, and methods to improve harvesting, transport, and storage of biomass, would be conducted at UIUC. The environmental impact and sustainability assessment research would investigate environmental consequences of conversion of land from current uses to feedstock cropping.

- **Biomass Depolymerization**, which is research into reducing the cost and energy consumption associated with biofuels such as ethanol. This research program would include laboratories that would focus on feedstock pretreatment, enzyme discovery, enzyme structure and function, and enzyme evolution and engineering.

- **Biofuels Production**, which is efficient conversion of biomass to fuel under industrial conditions. This research program would involve research in systems biology, pathway engineering, and host engineering.

- **Fossil Fuel Bioprocessing and Carbon Sequestration**, which is research into biological process for microcially enhanced oil recovery (MEOR), fossil fuel processing and biological carbon sequestration. MEOR techniques involve the use of microorganisms, nutrients, and oxygen to produce metabolic events that lead, by a variety of mechanisms, to enhanced oil recovery. Fossil fuel bioprocessing would cover research on way to utilize large reserves of fossil fuels, such as tar sands, shale, and soft coal that are likely to be extensively used for fuel production in the future. The research would focus on methods to facilitate the production of liquid or gaseous fuels (e.g., methane) from fossil fuel sources in ways that reduce the environmental impact of processing compared to non-biological methods. Biological carbon sequestration research would involve investigation of methods to improve the rates of removal of carbon dioxide from the atmosphere by photosynthesis and store the carbon dioxide in plants, soils and sediments; note that no field-testing of any carbon sequestering methods is proposed at LBNL or UC Berkeley.

- **Socio-Economics Systems**, which includes research programs focused on the social and environmental implications of the use of biofuels, including life-cycle environmental effects (such as the net greenhouse gas emissions) of each biofuel production pathway.

- **Discovery and Development**, which would support all of the scientific programs and would include computational and data management, chemistry, imaging, and synthetic biology.

Both the Helios and EBI research programs would require multi-disciplinary laboratories focused on solar-to-electrical energy and solar-to-chemical energy. Wet research laboratories (fume hoods with direct ventilation and specialized piped utilities), fermentation laboratories, and greenhouse facilities would be required to conduct the proposed research and therefore are included in the proposed facility. Advanced imaging and analytical tools related to feedstocks would be required for EBI. The laboratory space would also need to be adaptable to a variety of functions to accommodate new technology and different research programs.

3.4 PROJECT LOCATION AND SURROUNDING USES

LBNL is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County, and is located on approximately 200 acres that are owned by the University of California and leased to the U.S. Department of Energy (DOE) (see **Figure 3.0-1, Regional Location**). The LBNL site is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. UC Berkeley's main campus and its Hill Campus, including the Strawberry Canyon open space areas, lie southwest through southeast of the LBNL site. Residential neighborhoods and a small neighborhood commercial area in the city of Berkeley lie to the north and northwest, and regional open space, including the 2,000-acre Tilden Regional Park, lies to the northeast.

The project site is located in the southeast portion of LBNL, east of Chicken Creek, south of Lawrence Road, west of the Molecular Foundry building, near the existing LBNL security fence line (see **Figure 3.0-2, LBNL Site**). The project site, including the access road and other utility improvements, is approximately 6 acres and is largely undeveloped. Approximately 5.2 acres of the project site lie within LBNL and about 0.8 acre of the project site is located on UC Berkeley land (see **Figure 3.0-3, Project Site Location**). The site has been heavily graded recently in conjunction with the construction of the Molecular Foundry building and in the past to establish the terraces and a switch-back road (also known as the Chicken Ranch Road) that descends south along the hill to Centennial Drive. There is minimal vegetation present where the building, parking area, and other utility improvements would be located. The vegetation consists of non-native grasses and some newly planted trees associated with the Molecular Foundry building construction. The area where the access road would be constructed and improved is more densely vegetated with seasonal scrub, trees, and grasses. The Chicken Creek riparian area is to the west of the site and a wetland area associated with two hydrauger outlet pipes is present on one of the terraces down-slope of the building site. Building 31 and a small parking lot adjacent to the building is located to the north of the project site.

Surrounding research facilities include the National Center for Electron Microscopy, which specializes in high-powered microscopes, and the Molecular Foundry, which provides support and research in

nanoscience. The location of the project has been selected with a view toward fostering interaction between existing LBNL research programs in the Redwood cluster and the proposed facility. The location is also close to the Berkeley Lab's fence line to facilitate access and interaction between the project and UC Berkeley researchers and students.

3.5 PROJECT CHARACTERISTICS

The proposed project includes the following components that are shown on **Figure 3.0-4, Helios Conceptual Site Plan**:

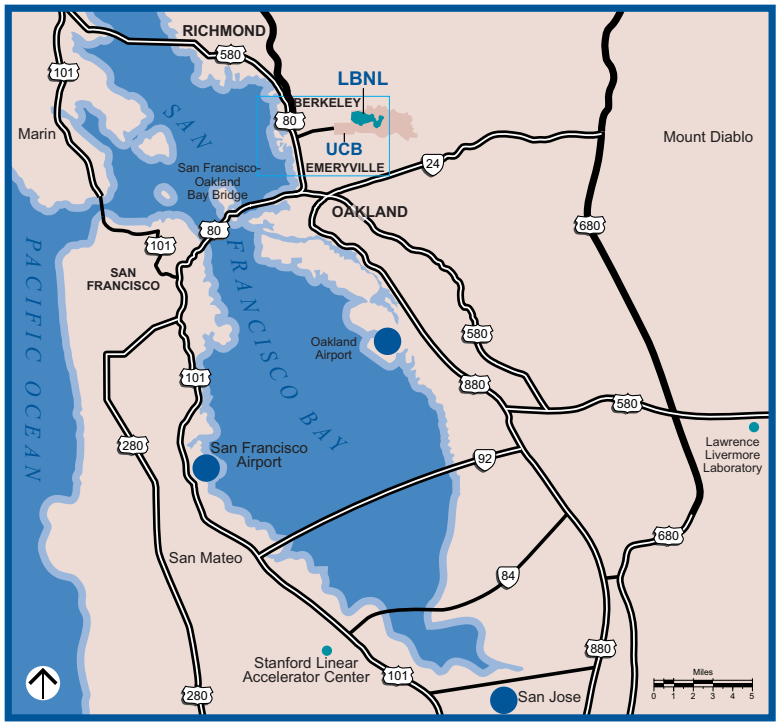
- An approximately 160,000 gsf research building, including a 250-seat auditorium and a cafeteria.
- A new controlled-access road that would provide access to the project site from Centennial Drive from just below UC Berkeley Botanical Gardens, including four options for the intersection of the new access road with Centennial Drive.
- A parking area along the access road with 50 parking spaces.
- Storm drainage improvements, including grassy swales and an underground hydromodification cistern or vault.
- Wastewater disposal improvements, including three options for the collection, conveyance, and treatment of wastewater.
- Other utility improvements, including electrical, natural gas, and water connections, and up to eight cooling towers, four boilers, a back-up generator, a fuel storage tank, and a liquid nitrogen storage tank.

Each of these components is described in detail below.

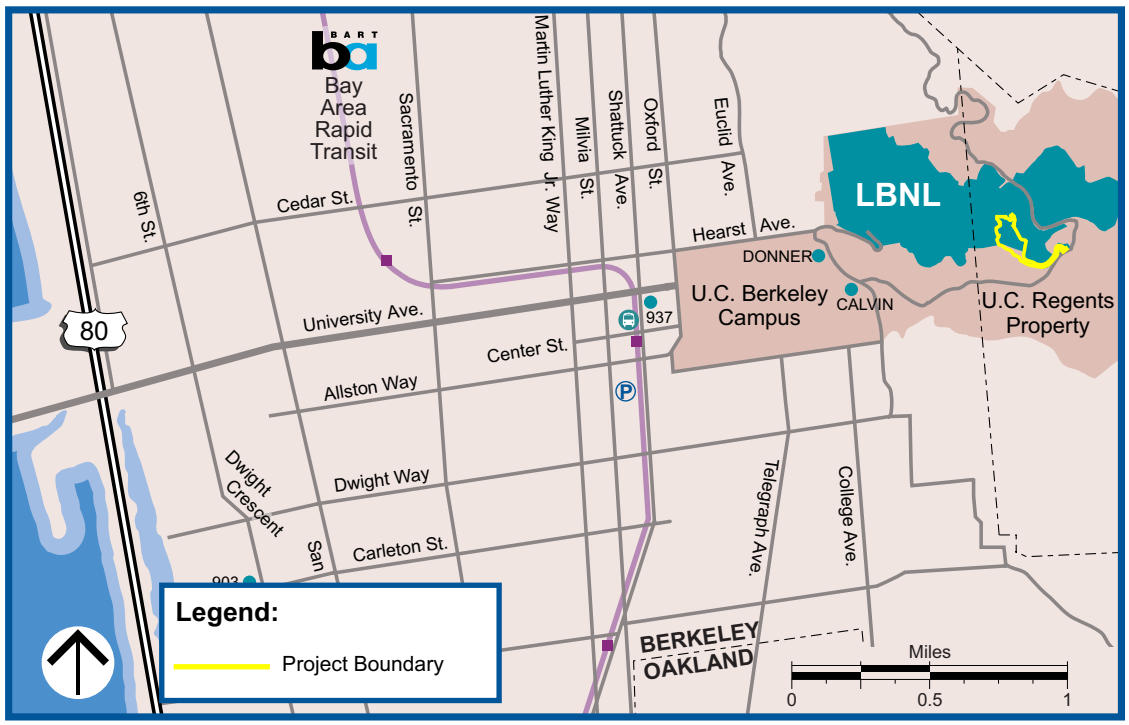
3.5.1 Research Building

The proposed research building would contain approximately 160,000 gsf of laboratory, office, and mechanical space and would be integrated into the hillside. There would be approximately 88,000 assignable square feet (asf)[2] of space. The research facility would be a narrow, stepped-design building, oriented generally north-south with separate levels devoted to different project components. This design would place the building parallel with the contours of the hillside, giving distinct lower and upper hillside entry points. **Figure 3.0-4** presents the conceptual design of the project. The southern portion of the building would house the Helios program, whereas the northern portion of the building would house the EBI program.

[2] Assignable square feet (asf) comprises the portion of building area assigned to or available for an occupant or specific use. Common areas such as restrooms, hallways, or mechanical space are excluded from asf.



LBNL Regional Location



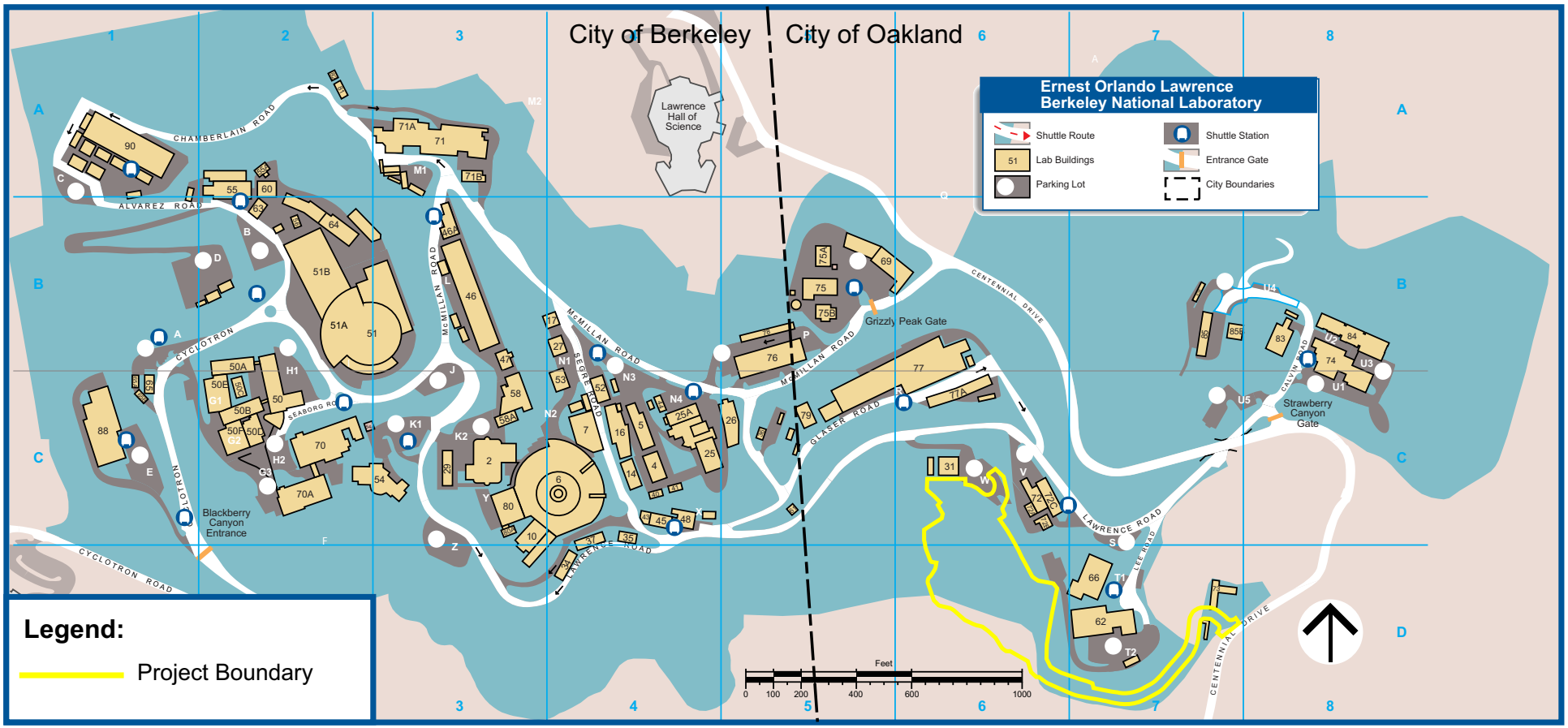
LBNL Local Location

NOT TO SCALE

SOURCE: Lawrence Berkeley National Laboratory - 2004, ESA - 2007

FIGURE **3.0-1**

Regional Location



LBNL Site

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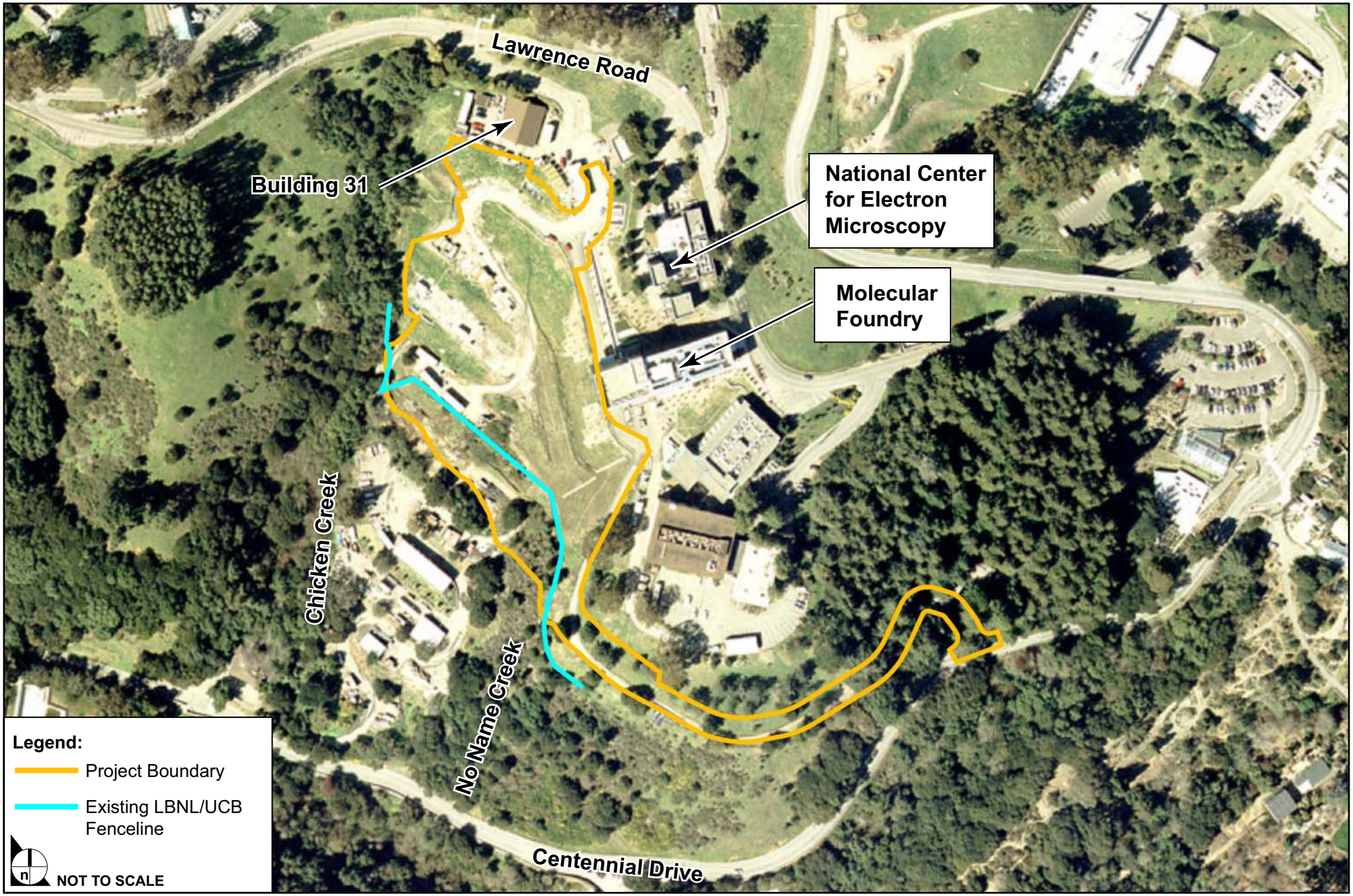
SOURCE: Lawrence Berkeley National Laboratory - 2004, ESA - 2007

FIGURE **3.0-2**

LBNL Site

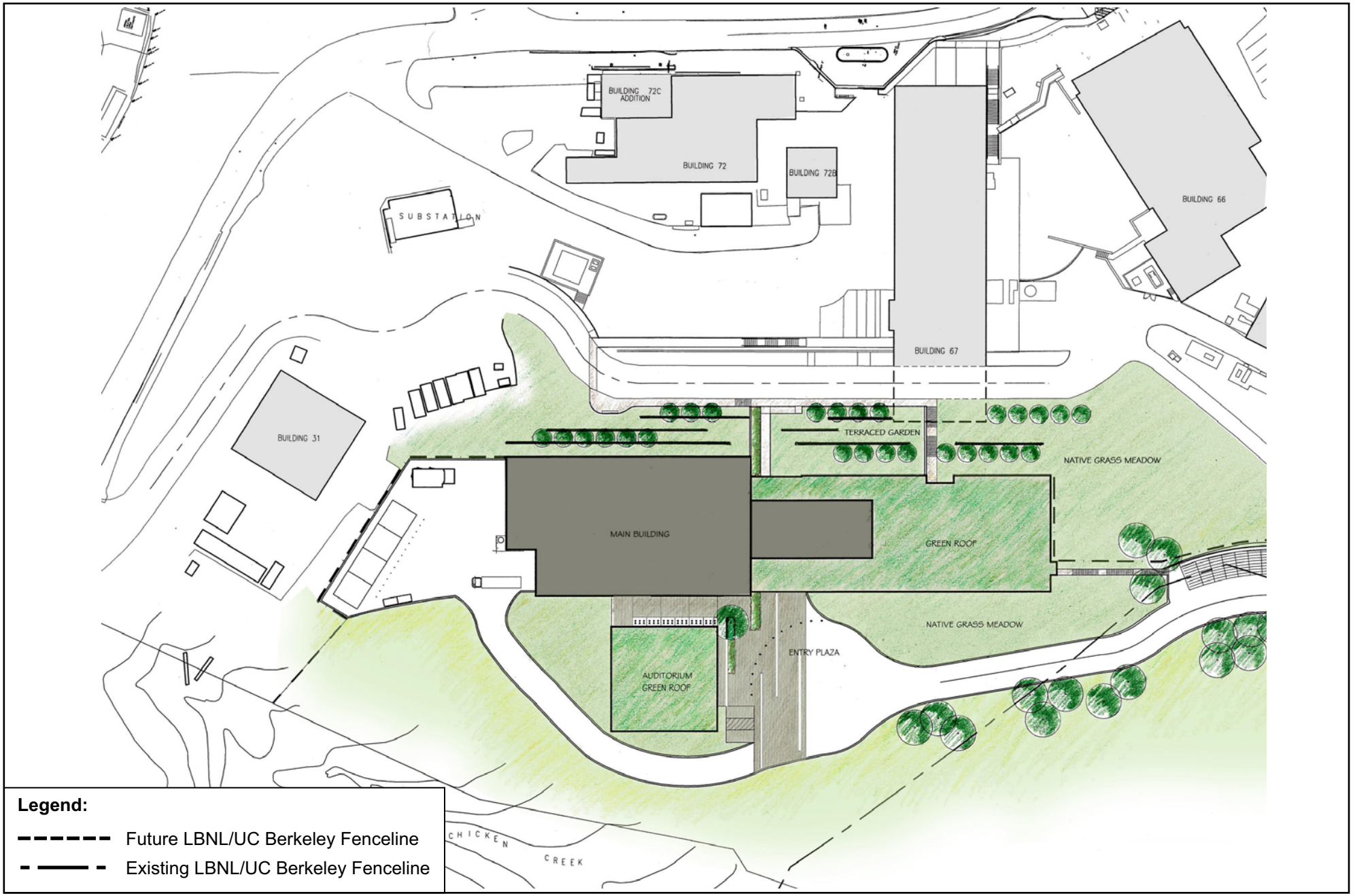


SOURCE: LBNL - 2006, ESA - 2007, Google Earth - July 2007, Impact Sciences, Inc. - July 2007

FIGURE **3.0-3**

Project Site

924-001•11/07



SOURCE: SMITHGROUP 2007

FIGURE **3.0-4**

Helios Conceptual Site Plan

924-001•11/07

The proposed building would comprise a total of seven floor levels, and the highest point of the building would be about 89 feet above the main entry level. **Figure 3.0-5, Longitudinal Cross Section of the Helios Project,** shows the building elevation and floor levels. The southern portion of the building that would house the Helios research program would consist of four levels, with one of the four levels completely below ground and one level partially below ground. The two lower levels (i.e., levels B1 and B2) would house a nano structure laboratory and wet chemistry laboratories. Open labs and office space would be provided on levels 1 and 2, with the main entry to the facility on level 1. The top level of the Helios research portion of the building (i.e., level 2) would connect to the EBI research portion of the building. This level would also include a green roof as part of its integration into the hillside. A covered walkway would be constructed along the southwestern portion of the building that would screen laboratory uses from direct sunlight during afternoon hours.

The northern portion of the building would include all seven floor levels, of which two would be below (or partially below) ground and five would be above ground. The two below-ground levels would house building support and mechanical equipment and shared lab space for the entire building. The top three above-ground floors would contain labs and office space associated with EBI. The roof level would contain building mechanical equipment as well as a greenhouse associated with EBI with a building parapet surrounding the area.

The main entry to the Helios Facility would be at level 1. A café would be constructed on level 3 of the EBI portion. This would place the café adjacent to the green roof and terrace garden of the Helios portion of the building. This café would serve the building users as well as persons in adjacent buildings. A 250-seat auditorium, located adjacent to the main building to the south of the site, would be shared between Helios and EBI programs.

A summary of the square footage and function of each level of the proposed Helios building is shown on **Table 3.0-1, Helios Building Summary**, below.

Table 3.0-1
Helios Building Summary

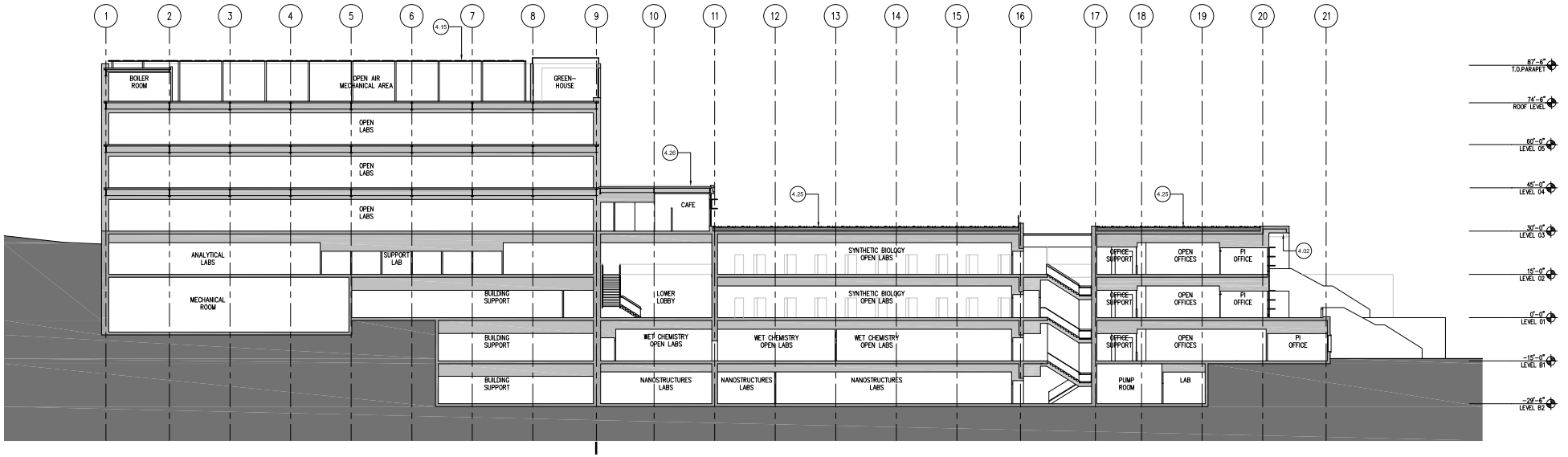
Building Level	Helios	EBI	Common Areas	Square Feet (sq. ft.)
6 (Roof)		Greenhouse; Mechanical Space		2,600
5		Open Labs and Offices		16,900
4		Open Labs and Offices		16,900
3		Open Labs and Offices	Café*	21,000
2	Open Labs and Offices	Open Labs and Support Space	Main Lobby*	26,300
1	Open Labs and Offices	Mechanical Space*	Main Lobby; Auditorium*	33,200 (5,400 auditorium)
B1	Wet Chemistry Laboratories	Building Support*		25,800
B2	Nanostructures Laboratories	Building Support*		15,700
Total				158,400

Source: SmithGroup 2007
. indicates shared spaces*

Additionally, detailed information regarding the various spaces within the research building is provided below.

Helios Laboratory Space

The Helios program would consist of a nano structures laboratory, wet chemistry laboratories, and dry laboratory space. The nano structures laboratory would be located in the lower basement level and would require the use of scientific equipment capable of viewing and analyzing nano materials. Nanoscience is research focused on fabrication, characterization, and use of materials, devices, and



1 LONGITUDINAL SECTION
SCALE: 1/16"=1'-0"

EBI **Helios**

LEGEND:

- GLASS TYPE 2
- GLASS TYPE 3
- CONCRETE
- EXHAUST AIR DUCT
- SUPPLY AIR DUCT

KEYNOTES:
NOT ALL KEYNOTES ARE NECESSARILY USED ON EACH SHEET

4.01 COMPOSITE METAL PANEL SYSTEM
4.02 COMPOSITE METAL PANEL SOFFIT
4.03 COMPOSITE METAL PANEL AT CAFETERIA
4.04 METAL AND GLASS ARCHITECTURAL BRIDGE WALKWAY
4.05 EXTRUDED ALUMINUM CHANNEL FASCIA
4.06 ARCHITECTURALLY EXPOSED PAINTED STRUCTURAL STEEL
4.07 CURTAIN WALL SYSTEM
4.08 WINDOW WALL SYSTEM
4.09 ACOUSTIC MECHANICAL LOUVERS
4.10 ALUMINUM FRAMING AND LAMINATED GLASS SKYLIGHT
4.11 ARCHITECTURAL CONCRETE (MEDIUM BROWN COLOR)
4.12 ARCHITECTURAL CONCRETE STAIR
4.13 ARCHITECTURAL CONCRETE RETAINING WALL
4.14 CONCRETE RETAINING WALL
4.15 PHOTOVOLTAIC PANELS AND FRAME SUPPORT
4.16 GLASS TYPE 1: CLEAR HIGH PERFORMANCE GLAZING WITH LOW-E COATING
4.17 GLASS TYPE 2: CLEAR HIGH PERFORMANCE GLAZING WITH 50% FRIT PATTERN
4.18 GLASS TYPE 3: SPANDREL GLASS
4.19 SUNSHADE TYPE 1: OPERABLE LAMINATED GLASS PHOTOVOLTAIC PANELS
4.20 SUNSHADE TYPE 2: FIXED LAMINATED GLASS PHOTOVOLTAIC PANELS
4.21 SUNSHADE TYPE 3: 2'-0" WIDE ALUMINUM SUNSHADE
4.22 GLASS GUARDRAIL WITH SS SUPPORT
4.23 PAINTED METAL GUARDRAILS / HANDRAILS
4.24 GREENHOUSE
4.25 GREEN ROOF SYSTEM
4.26 INSULATED CONCRETE WITH BUILT-UP ROOFING SYSTEM
4.27 TEMPERED GLASS DOORS
4.28 PAINTED HOLLOW METAL DOORS
4.29 MOTORIZED, PAINTED METAL ROLL-DOWN DOOR
4.30 ALUMINUM LIGHT SHELF
4.31 BUILDING SYSTEMS, SEE M.E.P. DRAWINGS
4.32 METAL AND GLASS INTERIOR STAIR

NOT TO SCALE

SOURCE: SMITHGROUP - August 2007

FIGURE **3.0-5**

Longitudinal Cross-Section of the Helios Project

systems through the control of matter at the nanometer-length[3] scale. These labs would support research focusing on both "hard" (e.g., rigid, static, structural elements such as nanocrystals, tubes, and lithographically patterned structures) and "soft" (e.g., flexible, dynamic, organic materials such as polymers, dendrimers, DNA, proteins, and whole cells) nanomaterials. Filtration of the air exhausted from the nano structures laboratory is not proposed at this time; however, if there were a potential for nanomaterials to become airborne, benchtop air emissions controls would be implemented. Wet chemistry laboratories would involve the regular use of chemicals for performing scientific research. Dry laboratory space would not involve the use of chemicals for research purposes. Common laboratory techniques such as chemical methods and physical methods (heating, microscopy, photometry, chromatography, electrophoresis, centrifugation, filtration, etc; would be used in the research.

EBI Laboratory Space

EBI laboratories would be located on three floor levels of the proposed building, with a fourth level containing laboratory space that would be shared by all programs in the building. These laboratories would include fume hoods and biosafety cabinets for the protection of the researchers. Common laboratory techniques such as chemical methods, physical methods, and biological methods (cell culture and genetic engineering) would be used in the research.

Offices

Office space in both the Helios and EBI portions of the building would be provided for researchers and administrative staff. Approximately 46 offices would be located throughout the building for use by LBNL employees, EBI researchers, visiting researchers, and graduate students.

Common Areas

Several areas of the Helios Facility would be shared by both programs. Conference rooms would be available on all levels of the EBI portion of the building and the top three levels of the Helios portion of the building. A two-story lobby would be constructed in the center of the building as a gathering area and defining space for Helios and EBI programs. This lobby would lead up to the café for the building that would provide food and seating for all employees of the Helios project. Additionally, a 250-seat auditorium would be constructed with the proposed project. The auditorium would provide a venue for symposia and other events associated with both research programs. The auditorium would be located west of the building, immediately adjacent to the lower level of the lobby entrance.

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3 A nanometer is a length of one-billionth of a meter.

Greenhouse

An approximately 700 asf greenhouse would be constructed on the roof of the EBI portion of the building that would be used for feedstock development. The greenhouse would be oriented in the southeastern corner of the EBI rooftop to maximize exposure to the sun. Greenhouse windows would be constructed of dual-paned, tempered, laminated glass designed to reduce glare. Drains from the greenhouse would be piped down and would connect to the building's main wastewater collection system.

Building Design Features

Building Design

The mission of the project design is to develop a building that is consistent with the proposed research, and to employ materials and implement practices which reduce reliance upon fossil fuels. In order to achieve green building principles and to be consistent with the 2006 LRDP, the design of the proposed facility would integrate the building into the hillside. The Helios portion of the building would be fitted with green roofs that would provide cooling, absorb rainwater, and minimize runoff. The auditorium would also utilize a green roof. The green roofs would be designed with landscaping that is both drought-tolerant and capable of absorbing storm water. A growth medium would be placed below the plant layer. A dirt separation layer would be placed below the growth medium to prevent root damage to the underlying roof layers. Below the dirt separation layer would be a thick drainage layer that would absorb excess water and would contain an outlet to drain storm water that has been filtered through the green roof. The roof of the building would be built with steel roof deck base to protect the uses underneath it. Additional layers of the base would provide insulation and a waterproof membrane.

Air handling units and exhaust fans would be located on the roof on the northern portion of the building and would be vibration isolated. A parapet wall would shield the roof-mounted equipment from view and would reduce noise. The roof-mounted equipment would be grouped together to the extent feasible.

Alternative energy sources such as solar energy and wind are proposed to be used for ventilation, lighting, and electrical generation. Photovoltaic (PV) panels would be located on the roof of the EBI portion of the project site. The roof has a split level design in this portion of the project and both roof areas would implement PV panels to the maximum extent feasible. Solar energy would also be harnessed through glass louvers along the walkway adjacent to the Helios facilities and at the south-facing windows of the EBI facilities. PV film laminated between two plates of glass will be considered to efficiently gather solar energy in a more compact format than PV panels and would be designed to reduce glare by specifying an anti-glare coating. PV panels may also be installed in the parking area. A parking canopy would be built along with the retaining wall for the access road. This canopy would use the retaining

wall as a support structure for the overhead canopy with PV panels mounted on top. The height of the canopy would allow for all passenger vehicles to park with sufficient clearance.

The Helios Facility would be designed in conformance with requirements for Group "B" research laboratory occupancies as defined by the California Building Code (CBC), Type I-B Fire Resistive Construction for the laboratory building and Type II-B for the auditorium, and with applicable seismic safety and fire safety code requirements. The building will be designed in accordance with Title 24 of the California Code of Regulations, 2007 edition. The UC Berkeley Seismic Review Committee, which consists of leading world experts on seismic design, has already reviewed the facility design twice and will review it at least one more time before the design is finalized The proposed project would also comply with accessibility requirements in accordance with the Americans with Disabilities Act (ADA).

Colors and Materials

The exterior of the building would be durable, water-resistant, compatible with the surrounding buildings, and appropriate for the intended uses of the site. The exterior cladding would include the use of metal, concrete, and glass. High performance glazing would be installed to reduce the effects of afternoon heat gains.

Lighting

The proposed building has been designed to maximize day lighting and reduce the use of internal artificial lighting. Internal lighting would utilize indirect sunlight where appropriate, and clerestories and light shelves would be used to aid in indirectly throwing natural light deeper into the floor plates. Because excess light and glare could affect the building users, especially during the afternoon hours, shades (possibly motorized) would be provided inside the building to reduce bright light and glare at various times of day. Fixed PV glass louvers may also be mounted on the exterior of the building to provide screening and to generate solar power for use in the building

Exterior lighting features would be implemented at both entrances, in the proposed parking lot, and along the walkway along the southern exterior portion of the building. All exterior lighting would be designed to minimize glare.

3.5.2 Roadway and Pedestrian Access, On-Site Circulation, and Parking

There would be two entrances to the building: a lower entrance on the downhill portion of the project which would be accessed via a new access road and parking area, and an upper entrance which would be

accessed on the uphill portion of the project from the existing service road west of the Molecular Foundry building.

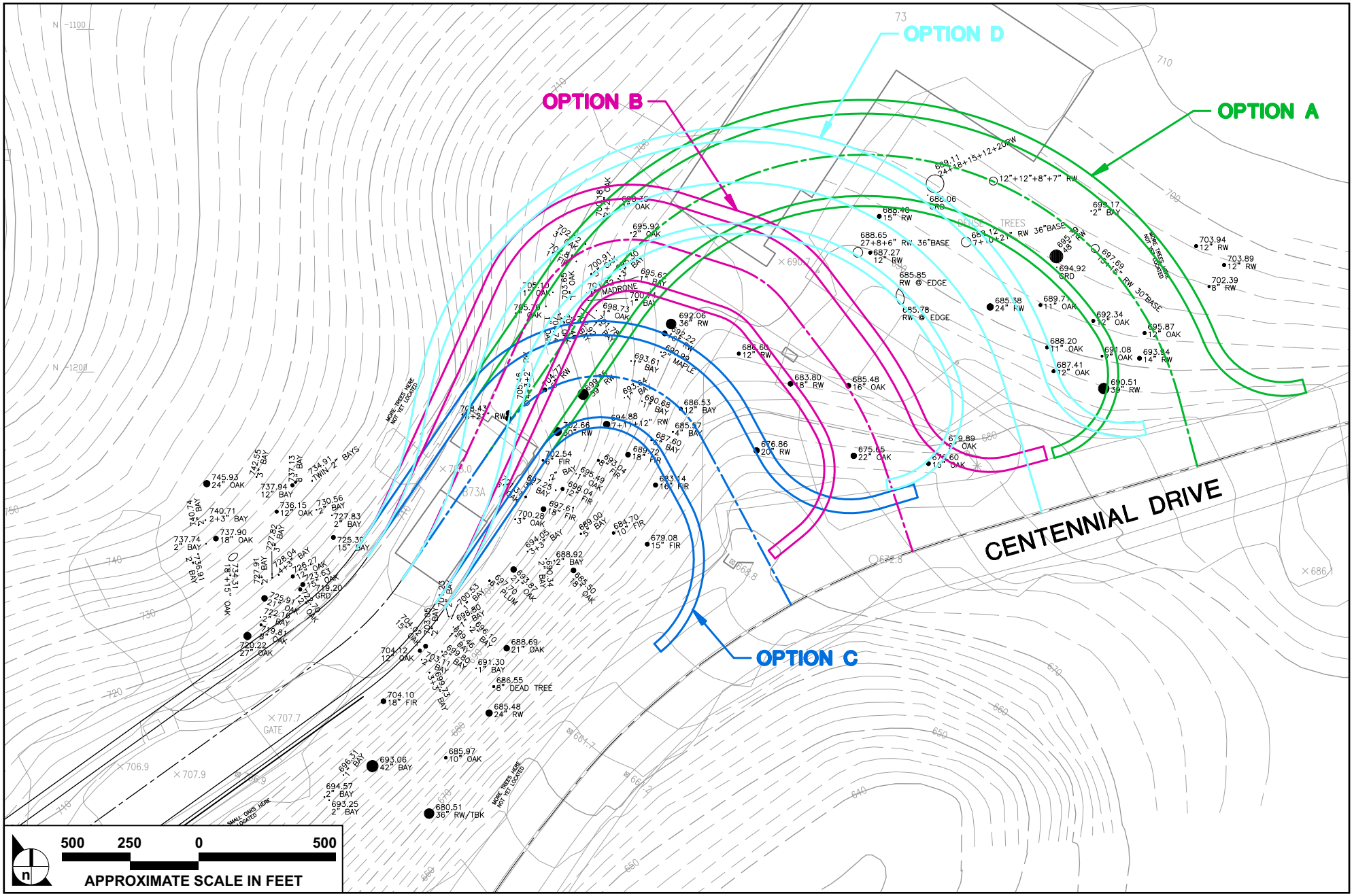
Proposed Access Road

Automobile access to the site would be via a new road, Helios Access Road, constructed from Centennial Drive, below the UC Berkeley Botanical Gardens. There is an existing one-lane service road from Centennial Drive that ends approximately 700 feet from the project site. The proposed project would upgrade this to a two-lane roadway and extend it to the project site. A new retaining wall would be built along the uphill side of the road in order to widen the road and a side walk would be provided along this side of the roadway.

LBNL is considering four options (Intersection Options A through D) for the intersection of the proposed Helios Access Road with Centennial Drive with the purpose of achieving a safe design for all vehicles (including emergency vehicles) and minimizing the removal of mature trees.[4] These options are shown on **Figure 3.0-6, Access Road to Centennial Drive Intersection Options**, and are evaluated in this EIR for environmental impacts. All four options would require the demolition of a small storage shed, Building 73A, which is an approximately 400 gsf wooden structure. Intersection Options A through C would also require the demolition of Building 73, which is a 5,100 gsf building.

A new security card scanner would be installed approximately 50 feet along the access road from the turn-off on Centennial Drive. A manned security gate (similar to the Blackberry Canyon gate or the other two Berkeley Lab entries) is not planned for this roadway because the road would not be a through road and would not provide access to any other facilities on the LBNL site except the proposed project and would be used by a small number of vehicles. Signs would be installed limiting the speed on the Helios Access Road to 15 miles per hour. Flashing lights would be installed along Centennial Drive, approximately 200 feet before the proposed intersection in both directions as an indication to motorists that an intersection is ahead.

4 Please also see **Section 6.0, Alternatives**. Alternative 5 in that section describes and evaluates the environmental impacts from the construction of an alternative alignment of the Helios Access Road.



SOURCE: Creegan & D'Angelo – September 2007

FIGURE **3.0-6**

Access Road to Centennial Drive Intersection Options

The new access road would end at the loading docks at the northern end of the proposed building. An area for vehicles to turn around would be provided on the west side of the research building near the lower entrance. Designated drop-off areas including a shuttle bus stop would be provided at the turnaround in front the Helios Facility lower entrance. Access to Lawrence Road from the Helios Access Road would not be available because the LBNL security fence would separate the project site from the rest of LBNL.

Other Vehicular Access

There is an existing service road that would remain in place between the project site and the Molecular Foundry building. This access road would provide an additional access point for emergency vehicles. Delivery vehicles access to the loading/unloading area at the northern end of the proposed building would be only from the west via the Helios Access Road.

Parking

There are 50 parking spaces proposed for the facility staff and visitors. Two of the 50 parking spaces would be ADA handicap accessible and would be located near the entrance to the Helios Facility and the auditorium. The rest of the spaces would be provided in a parking area approximately 600 feet long located southwest of the proposed building along the eastern side of the Helios Access Road. Additional parking would be available in existing LBNL parking areas along Lawrence Road to the north and east of the project site. The career project occupants would be eligible for LBNL access privileges, including parking permits for lots along Lawrence Road.

Bicycle Facilities

The proposed project includes 36 bicycle spaces, showers and locker rooms in order to encourage the use of bicycles for travel to the site. The bicycle spaces planned are greater than the Leadership in Energy and Environmental Design (LEED) requirement that bicycle parking be at least 5 percent of the total parking provided.

Pedestrian Facilities and Circulation

At the present time, pedestrian access to the project site is available only from the east via Lawrence Road and the service road to the west of the Molecular Foundry building. Pedestrian access to the site from Centennial Drive via the existing switchback road is not available because there is the fence and a locked

gate where the switch-back road connects to Centennial Drive[5] as well as another fence and locked gate on the first terrace west of the project site. While the fence on the first terrace would be relocated (see additional information on this below), the fence and gate on the switchback road near Centennial Drive would not change under the project. Therefore, pedestrians would access the project site from the east via Lawrence Road and the existing Foundry building service road, and from the west from Centennial Road via the new Helios Access Road. A side walk is included in the design of the proposed roadway. However, given the distance to UC Berkeley facilities, limited pedestrian facilities along Centennial Drive, and hilly terrain, it is expected that few of the persons accessing the Helios Facility would walk to the site.

An exterior staircase would run along the southern portion of the building and would allow access to and from the parking area to the service road and surrounding uses. Pedestrian circulation throughout the project would be via the elevators located near the entrance points or by stairs adjacent to the elevators.

Public Transportation

Transportation would be available through a shuttle system. The UC Berkeley BEAR Transit Line H, which currently operates along Centennial Drive, would be expanded to provide an additional stop in front of the lower entrance of the Helios Facility. The expanded shuttle service would connect the Helios Facility with UC Berkeley and downtown Berkeley. The LBNL internal shuttle route would provide access to the site through the stop on Lawrence Road near the Molecular Foundry building and the stop on Lee Road near Buildings 62 and 66. If an event is planned at the auditorium that would be open to the public, special shuttle buses would be provided.

3.5.3 Relocation of LBNL Fence

As part of the proposed project, a portion of the existing LBNL fence which extends in a north-south direction west of the building site would be relocated to the east so that it is coterminous with the proposed building (see **Figure 3.0-3**). This relocation is proposed so as to allow UC Berkeley faculty and students to be able to access the Helios Facility via the proposed Helios Access Road without going through the main entry gates of the Berkeley Lab. While these persons would be able to enter the building from the lower entrance, they would not be authorized to exit on the east side of the Helios Facility, except in an emergency situation that requires evacuation of the building, at which time they would be escorted by LBNL security personnel. Only the fence line would be relocated; the Berkeley Lab's physical boundary with UC Berkeley would remain unchanged.

5 This gate and road serve the UC Berkeley Corporation Yard, which is located to the west of the project site along the switchback road.

3.5.4 Landscaping and Tree Removal

The proposed project site would be landscaped consistent with LBNL Construction Standards and Design Requirements. The landscaping would conform to and complement the existing character of planting in the project area. Drought-tolerant, low water use, and low fire fuel volume plant materials (mostly grasses) would be installed in areas disturbed during project construction. No lawn areas are proposed. Irrigation would be used on site for the first five years in order to allow the plantings to establish. The landscaping materials to be used in the project would be reviewed by the LBNL and UC Berkeley Fire Marshals to ensure that fire fuel loads around the project site and along the access road are not increased as a result of project landscaping.

The proposed project would not affect the Chicken Creek riparian area as the project would not involve work outside the fence that runs alongside the riparian area. Large groves of trees would be maintained near the project site, including oak-bay woodland associated with Chicken Creek, eucalyptus stands, and conifer stands. Tree removal would, however, occur in conjunction with the construction of the access road, especially near the new intersection of the access road and Centennial Drive. These trees to be removed near the proposed intersection are at the edge of a larger grove of trees and the trees removed would represent a small fraction of the trees present in the grove.

Table 3.0-2, Trees affected by Helios Access Road, presents the number, species, and sizes of trees that would be removed for the construction of the proposed project. There are four options for the intersection of the Helios Access Road with Centennial Drive, as shown in **Figure 3.0-6**. These options would require the removal of different numbers of trees. **Table 3.0-2** presents the number of trees that would be affected, by the access road under Intersection Option B.[6] The number of trees that would be removed under the other intersection options are presented below in **Table 3.0-3, Trees Affected by Intersection Options**.

In compliance with LBNL Construction Standards, trees removed from the LBNL portion of the project site would be replaced at the ratio of 1:1 ratio. The replacement trees would be planted on the project site or in other parts of the Berkeley Lab site and would be 48"box specimens (approximately 6-inch trunk diameter trees) or of a size that is recommended as appropriate by an arborist. Trees on UC Berkeley campus property and not within the LBNL boundaries, identified by the campus landscape architect as specimen trees, would be replaced with three trees for each specimen tree removed, in accordance with the campus specimen tree program. Trees will be planted at a distance from the proposed building that meets the LBNL and UC Berkeley Fire Marshal defensible space requirements.

[6] This option is considered the base case and is used throughout the EIR to present the proposed project. The other three intersection options are presented where relevant to disclose incremental effects.

Table 3.0-2
Trees Affected by Helios Access Road

Species	Diameter (in inches)	Number
Oak	1	8
	2	7
	3	2
	4	2
	5	1
	6	6
	8	3
	10	1
	12	3
	15	3
	16	2
	18	1
	22	1
	27	1
	2 + 2 (multi-trunk)	1
	5 + 6 (multi-trunk)	1
	21 + 12 (multi-trunk)	1
Subtotal		*44*
Redwood	2	18[1]
	3	2[1]
	6	6
	14	6
	15	1
	18	1
	30	1
	4 + 3 + 2 (multi-trunk)	1
	18 + 21 (multi-trunk)	1
	27 + 8 + 6 (multi-trunk)	1
Subtotal		*18 (38)*

Species	Diameter (in inches)	Number
Bay	1	7
	2	6
	3	1
	4	1
	5	2
	6	3
	8	3
	10	1
	6 + 8 (multi-trunk)	2
Subtotal		*25*
Madrone	3	1
Subtotal		*1*
Fir	1	1
	6	1
	18	1
Subtotal		*3*
Italian Cypress	2	5
	3	4
Subtotal		*9*
Pine	8	1
	15	2
	18	3
Subtotal		*6*
Willow Clump	N/A	4
Subtotal		*4*
Total		***110 (130)***

Source: Smithgroup 2007

[1] *These trees were planted as part of the Molecular Foundry Project. They would be transplanted as part of the project and would, therefore, not be permanently removed. Please see* ***Section 4.3, Biological Resources****, for more information regarding tree removal.*

Table 3.0-3
Trees Affected by Intersection Options[1]

Option A	Option B (base option)	Option C	Option D
128	110	104	127

Source: Smithgroup 2007

[1] *All numbers in this table reflect total trees removed, and do not include transplanted redwoods, noted above.*

3.6 UTILITIES

The Helios project would comply with the UC Policy on Sustainable Practices[7] and includes several sustainable development initiatives, which would be directed, in part, to reduce utility demand. **Table 3.0-4, Helios Project Utility Demand**, presents the project's annual and peak demand for utilities.

Table 3.0-4
Helios Project Utility Demand

Utility	Peak Daily Demand	Annual Demand
Potable Water*	30,640 gpd	4.8 million gals/year
Wastewater**	12,320 gpd	3.1 million gals/year
Electricity	1 MW per day	4.4 million kWh/year***
Natural Gas	37 therms/hr	10,000 therms/year

Source: LBNL 2007

** Includes cooling tower make-up water, deionized water, cold water for research use, cold water for domestic use.*

*** Includes domestic wastewater and cooling tower blow down*

**** If even half of the planned on-site energy generation from photovoltaics is achieved, the net electricity that would be obtained from off-site sources would be about 2.1 million kWh/year.*

3.6.1 Potable and Fire Suppression Water

Potable water service (including water for fire suppression) for the Helios project would be supplied from an existing 8-inch high-pressure water main along the existing service road for the Molecular Foundry building, which is immediately east of the project site. The existing water main would be extended 50 feet to the project site to provide water service. Additionally, the water main would be extended 350 feet to provide fire hydrant coverage at the lower level of the proposed building.

7 http://www.ucop.edu/ucophome/coordrev/policy/ (see 3/22/07) UC Policy on Sustainable Practices: Issuance Letter, Policy Statement, and Guidelines.

Water demand for the Helios project is estimated to average about 16,200 gallons per day (gpd), with peak day demand estimated at 30,640 gpd. The annual demand, assuming recycling of water in the proposed cooling towers, is estimated to be about 4.8 million gallons per year. This includes demand for domestic water, fire water, laboratory water including de-ionized water, and cooling tower water. Domestic hot water would be produced through the boiler system located on the roof level of the building. The proposed project includes high-efficiency fixtures and waterless urinals which would reduce water demand.

3.6.2 Wastewater

Wastewater flows from the southern portion of LBNL, hill portions of UC Berkeley, and the Panoramic Hill area in the city of Berkeley all contribute to sub-basin 17-503. This sub-basin is currently constrained during peak wet weather conditions. Overflow has occurred at the manholes along Dwight Way between Prospect Street and Telegraph Avenue. In August 2005, LBNL prepared a sanitary sewer study to examine the various options the Berkeley Lab could implement to divert wastewater flows from the constrained sub-basin. Based on this study and more recent information, as part of the proposed project the Berkeley Lab is currently evaluating three options for collection and disposal of wastewater generated by the proposed project and other existing and future development so as to avoid further aggravating the existing peak wet weather conditions in sub-basin 17-503. These options are described below:

Wastewater Option 1—Divert LBNL and UC Berkeley Hill Campus Area Flows to Hearst Avenue Outfall

Under this option, the Berkeley Lab would divert existing and future flows (about 86,000 gpd) from the southern portion of the Berkeley Lab site and from the UC Berkeley Hill Campus area that currently discharge into the UC Berkeley sewer main in Centennial Drive at the Strawberry Outfall to an alternate outfall along Hearst Avenue. To implement this option, the Berkeley Lab would upgrade a 1,600 foot section of an existing on-site gravity sewer pipe aligned along Lawrence Road to a 12-inch pipe; divert flows from the 8-inch main on Centennial Drive to this upgraded pipe; and pump the wastewater to a tie-in location near Building 45 using three pump stations (see **Figure 3.0-7, Wastewater Option 1**). A portion of the pipeline alignment would pass through an area with known contamination. In this area, the pipeline would be constructed aboveground on pipe supports. This option would free up some capacity in sub-basin 17-503 and would allow the project's wastewater to flow to the existing sewer line along Centennial Drive and into sub-basin 17-503 without contributing to a surcharge event.

Wastewater Option 2—Divert LBNL and Hill Campus flows to New Tie-in at Bancroft Way

Under this option, wastewater flows would be diverted from the Strawberry outfall and discharged into a new tie-in with the City of Berkeley sewer system in Bancroft Way. The option would require enlargement of a section of an existing sewer line and the construction of a new sewer pipeline section. The existing sewer line that extends from a UC Berkeley manhole at the intersection of Centennial Drive and Stadium Rim Way, around the eastern perimeter of the Memorial Stadium up to a manhole near Canyon Road, would be enlarged to a 10-inch sewer using pipe bursting.[8] From this point, approximately 500 feet of a new 10-inch sewer line would be installed in the roadway and the parking area around the southern perimeter of the Memorial Stadium up to Warring Street, and then along Warring Street to connect to the City's 16-inch sewer line near the intersection of Warring Street and Bancroft Way. **Figure 3.0-8, Wastewater Options 2 and 3**, shows the alignment of this option. Because a separate sewer line would be installed to convey the wastewater from only LBNL and UC Berkeley's Hill Campus, the construction of this line would not affect the existing sewer line that serves the Panoramic Hills neighborhood. There is adequate capacity in the sewer main in Bancroft Way and Durant Avenue to handle the flows from the eastern portion of the Berkeley Lab and the Hill Campus.

Wastewater Option 3—Divert LBNL and Hill Campus flows to Side Sewer One on UC Berkeley Campus

Under this option, wastewater flows would be diverted from the Strawberry outfall and discharged into a new tie-in with the UC Berkeley campus wastewater system. This option would involve the construction of an approximately 750 feet long section of a 10-inch new pipeline from an existing manhole at the intersection of Centennial Drive and Stadium Rim Way along the northeastern perimeter of the Memorial Stadium to connect to Side Sewer One on the western edge of the Berkeley campus. About half of the length of the new pipeline would be in roads used by the public. The UC Berkeley Side Sewer One extends from Piedmont Avenue, west down University Drive, beneath pedestrian walkways on the UC Berkeley campus, and connects into the City of Berkeley sanitary sewer at Oxford Street. This option would also include expanding the capacity of Side Sewer One using pipe-bursting technologies to

8 Pipe bursting involves digging an entry pit at one end of the pipe to be replaced and running a pneumatic pipe-bursting tool and an expander into the pipe through the pit opening. The pipe-bursting tool is a soil displacement hammer fitted with cutting blades. As the pipe burster hammers through the old pipe, the expander moves broken fragments and dirt out of the way to make room for the new pipe, which is attached to the back of the tool and follows it into the void (Note that in addition to a pneumatic pipe-bursting tool, a hydraulic pipe-bursting tool is also available). After the new pipe is in place, crews connect service laterals at specified locations. This technology allows for pipelines located in busy streets to be replaced in a short period of time without blocking traffic and without major excavations. The technology is well established and has been used extensively throughout the United States.

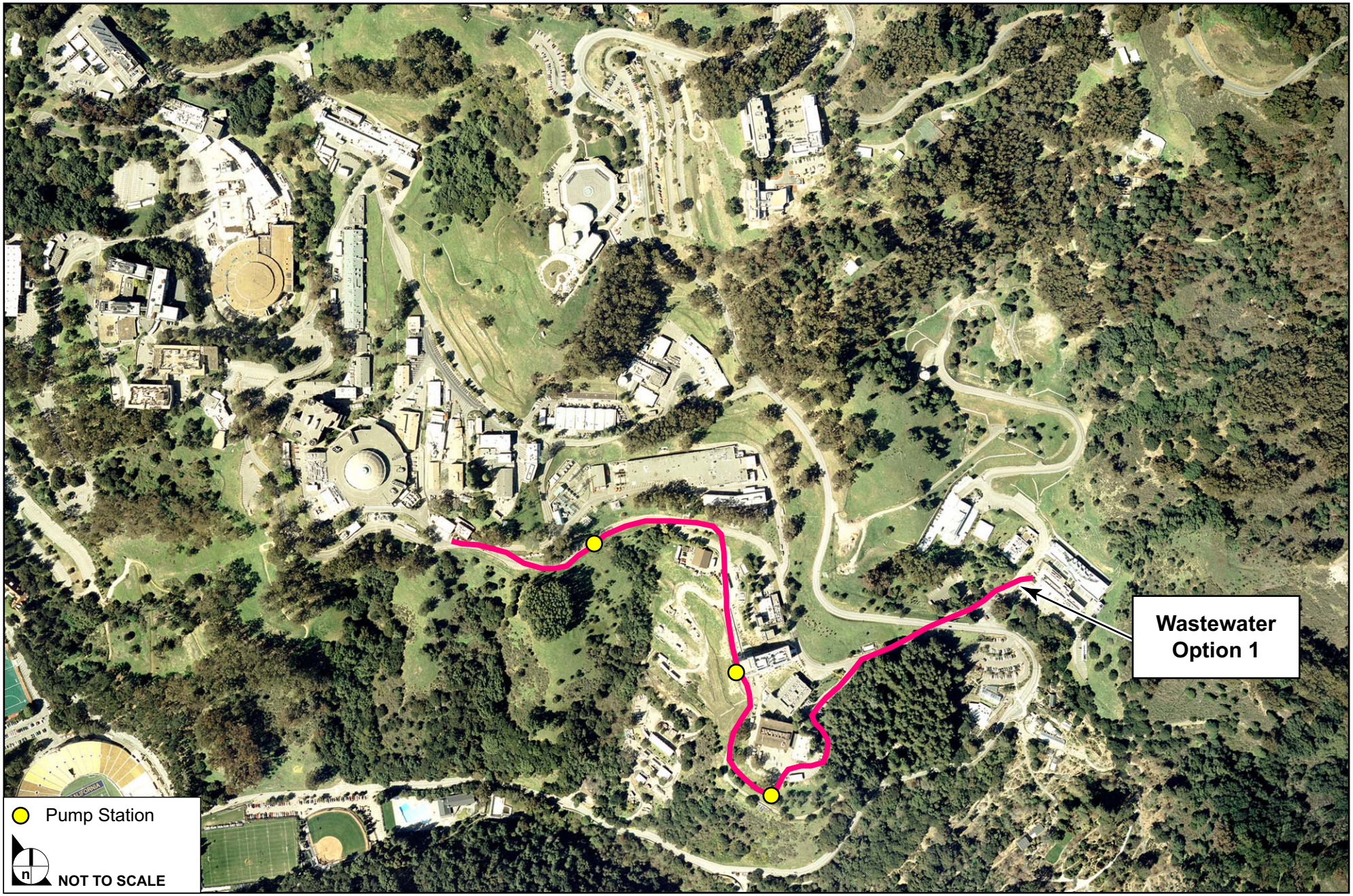
accommodate the additional flows. **Figure 3.0-8** shows the alignment of this option. This option would be located entirely within UC Berkeley campus.

Construction of the new pipeline sections within streets used by the public under both Wastewater Options 2 and 3 would be completed in less than one week. To minimize disruption of traffic and maintain adequate access at all time, one traffic lane would be kept open at all times and traffic control would be provided.

3.6.3 Stormwater

The project site is largely undeveloped, although portions of the site are graveled or paved, especially along the switchback road that descends from the project site to Centennial Drive and the existing service road from Centennial Drive. Furthermore, the site is on a hillside. There are no storm drains currently on the site, other than two v-ditches on the slope to the southwest of the Molecular Foundry building and four inlets along the service road from Centennial Drive. Stormwater that falls on the project site either percolates or is conveyed by overland flow into No Name Creek and Chicken Creek, the two drainages that are to the north and southwest of the project site. Drainage pipes were installed in the engineered slopes below the Molecular Foundry building to intercept and drain groundwater, but no groundwater discharge from these pipes has been observed. There are two hydrauger outlet pipes that discharge on the first terrace downslope of the Helios building site. Stormwater that falls on the service road is conveyed by underground pipes to existing underground storm drains in Centennial Drive that ultimately discharge to the Botanical Garden Creek.

The Helios site design would minimize the amount of impervious surfaces by limiting the footprint of the building and by creating a compact circulation and parking area. Furthermore, as discussed above, green roofs would be installed in the Helios portion of the building and on the auditorium, which would reduce stormwater runoff. However, construction of the proposed project would add about 2 acres of impervious surfaces to the project site, which would result in increased stormwater runoff. The project includes several features to control stormwater runoff. Downspouts from the Helios project would utilize a splash block that would direct stormwater flows into landscaped areas, including the green roofs. A series of grassy swales would be installed along the downslope side of the access road and turnaround, and all stormwater from upper portions of the project site would be directed to the grassy swales (see **Figure 3.0-9, Grading and Utility Plan-Building Site, Figure 3.0-10, Grading and Utility Plan-Parking Area,** and **Figure 3.0-11, Grading and Utility Plan-Centennial Drive Intersection**). From the grassy swales, storm drains would convey the stormwater to a stormwater cistern or vault located underneath the turnaround area to the west of the building. The project will avoid hydromodification

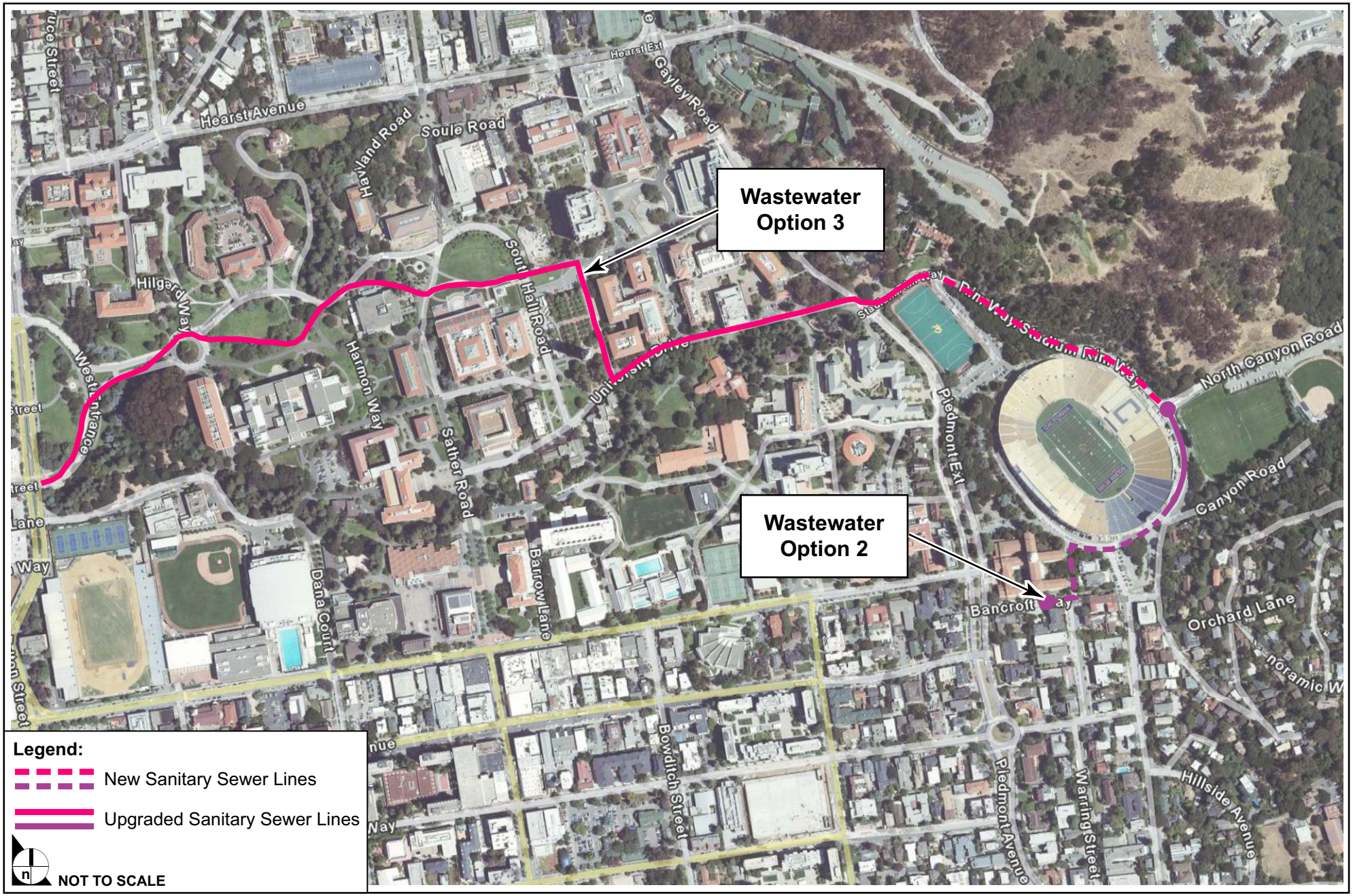


SOURCE: SMITHGROUP 2007, Impact Sciences, Inc. - August 2007

FIGURE **3.0-7**

Wastewater Option 1

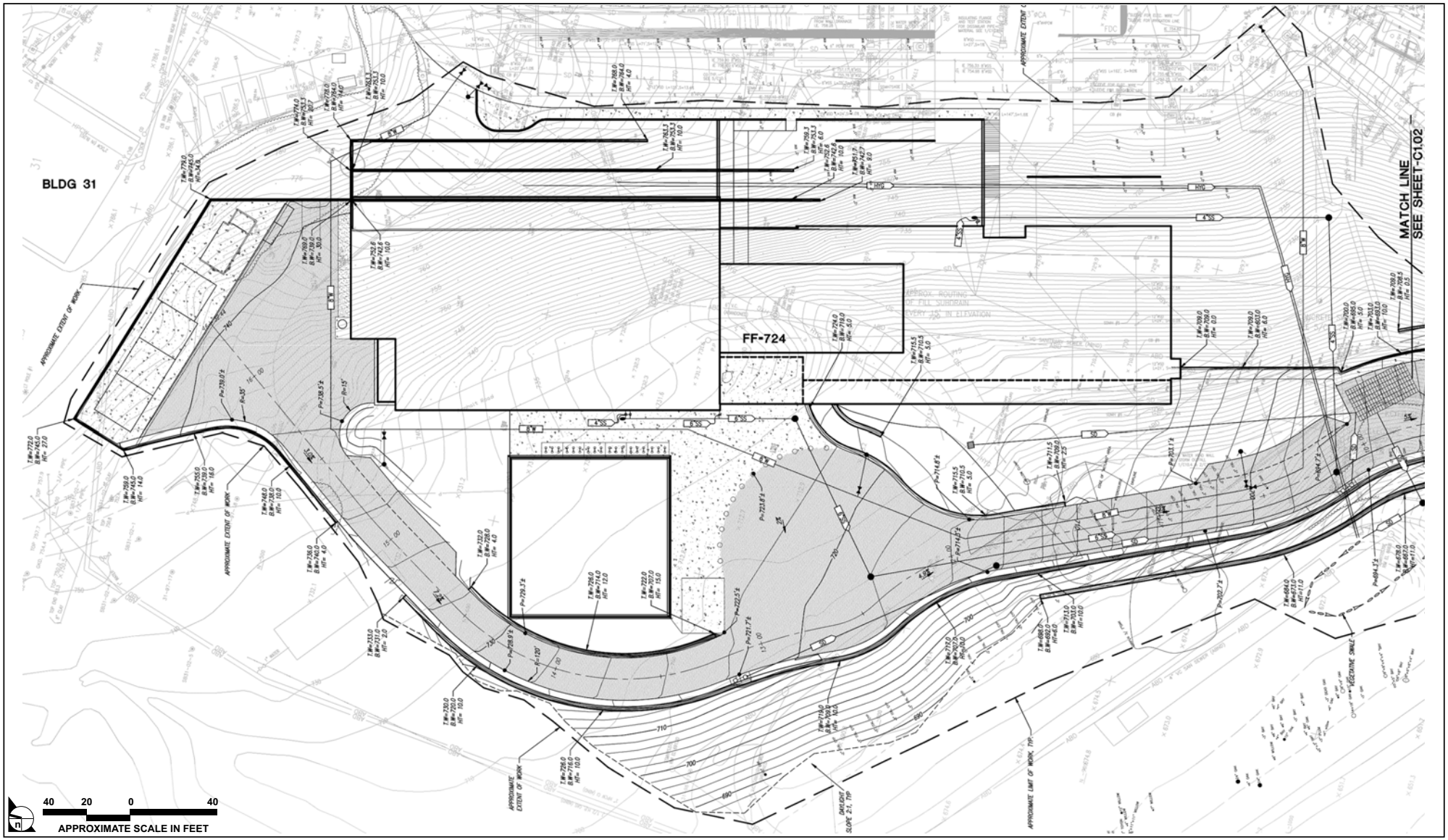
924-001•11/07



SOURCE: SMITHGROUP 2007, Impact Sciences, Inc. - August 2007

FIGURE **3.0-8**

Wastewater Options 2 and 3

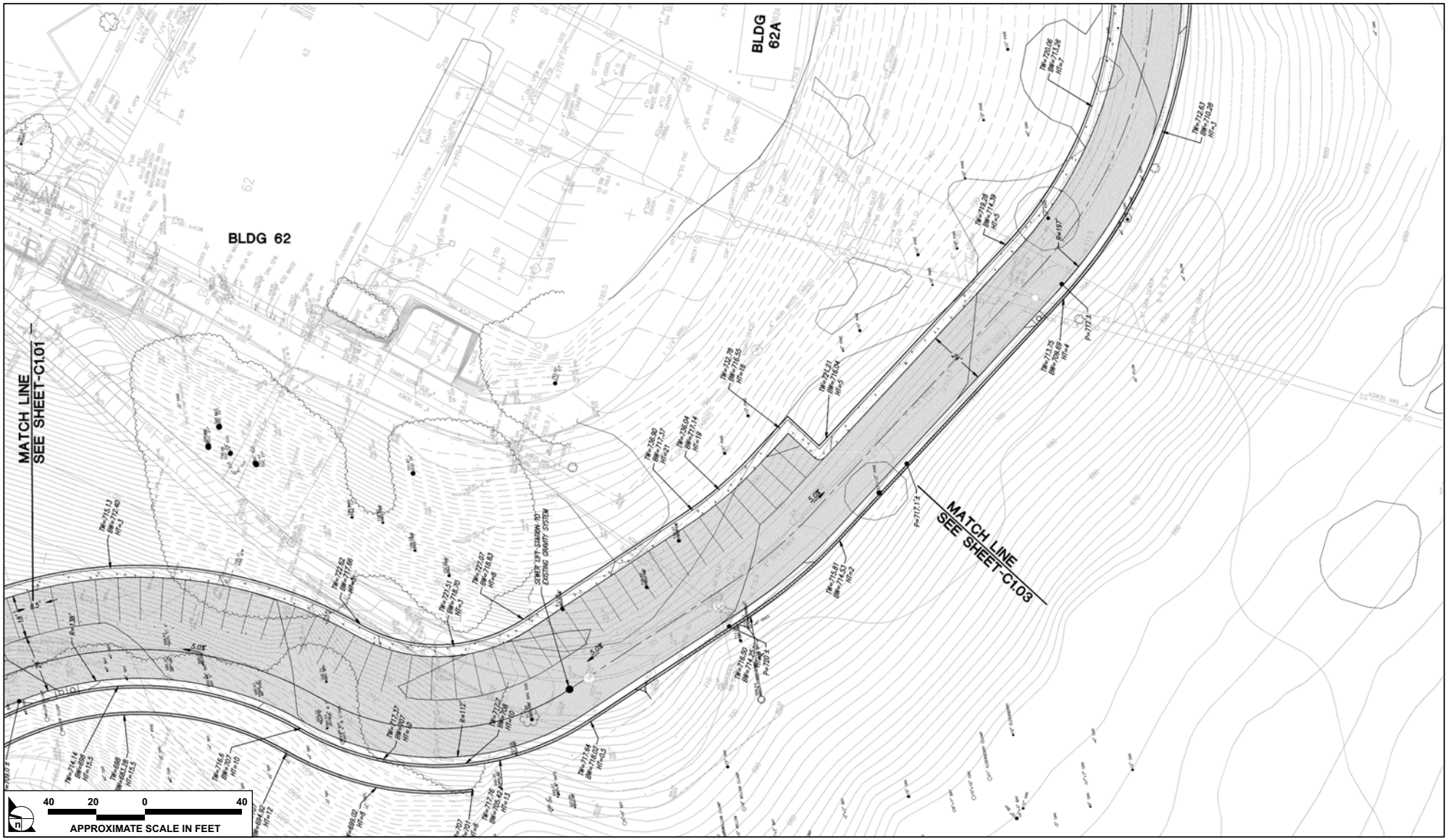


SOURCE: Creegan & D' Angelo - 2007

FIGURE **3.0-9**

Grading and Utility Plan - Building Site

924-001•11/07



SOURCE: Creegan & D' Angelo - 2007

FIGURE **3.0-10**

Grading and Utility Plan - Parking Area

924-001•11/07

SOURCE: Creegan & D' Angelo - 2007

FIGURE **3.0-11**

Grading and Utility Plan - Centennial Drive Intersection

924-001•11/07

impacts by constructing this stormwater vault to maintain pre-project peak flows and flow durations. The design of the stormwater vault was developed using the Bay Area Hydrology Model (BAHM) program (ver 1.0, August 2007) supplied by the Alameda Countywide Clean Water Program. The estimated storage required to maintain post-development flows approximately equal to the predevelopment peak flows and flow duration for the project site were estimated and the hydromodification cistern has been designed to detain the runoff and release it at a rate that does not result in erosion in the receiving waters. Stormwater from the cistern would be conveyed by a storm drain outlet into Chicken Creek or No Name Creek. An energy dissipater would be installed at the discharge point to avoid hillside erosion.

Furthermore, the project design will utilize numeric sizing criteria for all grassy swales and other stormwater control features and will use hydromodification controls to the maximum extent practicable (MEP). The existing hydraugers would be combined into one hydrauger which would be rerouted around the Helios building to discharge at the head of No Name Creek. An energy dissipater would be installed at the discharge point to avoid hillside erosion.

3.6.4 Chilled and Hot Water Systems

Chilled water is used for cooling building space and for laboratory use. Up to eight cooling towers would be built in the utility area adjacent to the northern end of the Helios building. Each cooling tower would process approximately 735 gallons of water per minute and would be designed to cool the water to 66 degrees Fahrenheit. Four 1.7 MMBtu/hour natural gas fired boilers would be installed on the roof of the Helios building to provide hot water.

3.6.5 Electricity

Both peak day and annual demand for electricity for the proposed facility are reported in **Table 3.0-4**. As indicated in that table, if even half of the planned on-site photovoltaic generation of energy is achieved, the annual purchase of electricity from off-site sources would be reduced to less than half the building's total demand. The existing LBNL electrical power supply currently extends to the utility plant associated with the Molecular Foundry building. The project would connect to the existing electrical underground lines. There is currently sufficient electrical capacity to serve the proposed project. Emergency electrical power would be provided through a back-up generator located in the utility area north of the loading dock. A 750-kilowatt diesel generator with a 3,000-gallon, above-ground fuel storage tank would provide electricity to the building for up to 48 hours.

3.6.6 Natural Gas

Natural gas would be required for use throughout the laboratories and in the boilers for heating. An existing sub-grade 7-inch high-pressure natural gas main crosses between the Molecular Foundry building and Building 72. This gas main would be extended approximately 100 feet to connect to the proposed project.

3.6.7 Exhaust

All air exhausts would be located on the roof of the EBI portion of the building. The project would include one common building exhaust system for both fume hoods and general exhaust. The exhaust capacity of the proposed building is estimated to be approximately 200,000 cubic feet per minute for the four primary fans. Each exhaust fan would be approximately 6 to 7 feet high, with the exhaust stack extending another 30 to 35 feet above the fan, and would release air at a temperature range of 74 to 80 degrees Fahrenheit. There would be a parapet wall around the roof enclosing the exhaust system.

Up to 75 fume hoods would be installed in the Helios and EBI laboratories. Typical chemical fume hoods would be variable air volume hoods. Each fume hood would be equipped with an air flow sensor. Flammables and corrosives storage would take place in cabinets made for this service either beneath or adjacent to a fume hood, and cabinet vents would be connected to the hood exhaust system. Discharge from the fume hood exhaust would meet all applicable vertical velocity and stack height requirements.

Air intakes for the proposed project would be located in different areas along the roof. Potential air re-entrainment from the proximity of air exhausts and air intakes would be avoided through specific engineering and design, including wind-tunnel modeling during the detailed design phase of the proposed project.

3.6.8 Hazardous Waste

Hazardous waste would be stored in waste accumulation areas (WAA) within the Helios Facility pending pick-up and transport to the UC Berkeley Hazardous Waste Handling Facility. The WAAs would be constructed consistent with the Environmental, Health, and Safety (EH&S) Department standards regarding proximity to sensitive receptors and construction materials. All waste disposal would meet the highest current standards for safety, health, and minimal environmental impact.

3.7 FACILITY OPERATION AND MAINTENANCE

Following completion of project construction, the Helios Facility would be operated by UC Berkeley pursuant to a Memorandum of Understanding (MOU) between UC Berkeley and LBNL. UC Berkeley

would provide maintenance, custodial services, mail and delivery services, hazardous waste handling, and emergency response services. UC Berkeley would provide security and landscape maintenance services to the western side of the Helios Facility and LBNL would provide security and landscape maintenance services to the eastern side of the building. UC Berkeley would also maintain the access road and parking area that would serve the building.

3.8 CHEMICALS AND RESEARCH MATERIALS ON-SITE

Research that would be conducted in the proposed facility would involve a wide variety of research materials, including hazardous chemicals, non-hazardous organic and inorganic materials; nano-scale materials, and genetically modified/transgenic plant materials and microorganisms. As noted above, once constructed by LBNL, the management and operation of the Helios Facility would be taken over by UC Berkeley. Therefore, the storage, handling, use and disposal of all hazardous materials, hazardous wastes and other scientific materials within the Helios Facility would be subject to UC Berkeley EH&S programs.

Within the Helios portion of the proposed facility, temporary storage, and use of hazardous chemicals, radioisotopes, and biohazardous materials would occur in the laboratories designed for the synthetic biology research program. Nanomaterials and chemical use would occur in the laboratories assigned to nano structures research located in the lower basement of the Helios Facility.

Although Biosafety Level 2 (BSL-2) research is currently not planned in the proposed facility (BSL-1 research is planned), the Helios Facility's biological research areas would be built to BSL-2 standards, which is the standard required for working with organic agents with a moderate potential hazard. In all portions of the building, primary and secondary barriers would be used to reduce or eliminate exposure of the laboratory environment and the outside environment to potentially hazardous agents. Primary barriers (biosafety cabinets and fume hoods) are designed to protect personnel and the laboratory environment from exposure to hazardous agents. Facility design criteria provide secondary barriers as a protection for personnel inside and outside the laboratory. Air changes would be implemented for worker safety. All lab facilities would maintain negative pressure, which would control the release of any airborne materials to non-lab areas via doors and other openings. All flooring in the labs would be designed to be chemical resistant and seamless. The laboratory staff and researchers would be trained in the use of certified biosafety cabinets, autoclaving, and other specialized disinfection techniques, and biological materials handing protocols.

The development of and research related to transgenic (genetically modified) plant materials and microorganisms would occur in five thematic areas associated with the EBI program. All research related

to transgenic organisms will be required to comply with National Institutes of Health (NIH) Guidelines for Research Involving Recombinant DNA Molecules. The Guidelines specify containment practices for plants and microorganisms, depending on the potential hazard posed by the organism. The potential for worker exposure is minimized by compliance with Centers for Disease Control (CDC) and NIH guidelines for research involving these materials.

3.9 PROJECT POPULATION

It is anticipated that the Helios Facility would contain approximately 500 people, including researchers, administrative personnel, and visitors. Approximately 132 people would be relocated to the Helios Facility from other locations within LBNL (45 persons) or UC Berkeley (about 87 persons), and there would be 368 new people that would be at the project site as a result of project implementation. However, because the 87 persons from UC Berkeley would also be new to the LBNL site, the project would increase the LBNL population by about 477 persons (368 new persons plus 87 persons relocating from the UC Berkeley campus).

Given the 250-seat capacity of the auditorium, up to 750 people could be accommodated in the building at one time. However, no more than 625 people are anticipated to be at the site, even when the auditorium is at full capacity. This is because about half of the 250 persons in the auditorium at full capacity are expected to be researchers and visitors already at the Helios Facility and the other half (about 125) would come to the site specifically for the event. Most of these persons are expected to come from UC Berkeley. The auditorium would be used mostly in the afternoons, although some events could be all-day events. The auditorium would be used three to four times a week, but likely only once a week at full capacity. The auditorium would be used for seminars, symposia, and conferences related to the Helios Facility research programs. The auditorium is needed because there is no facility of this size available in this portion of LBNL. Although there is a 180-seat auditorium in Building 66, but the use of this auditorium is restricted to LBNL users only. The Helios auditorium would be open to both LBNL and UC Berkeley users.

3.10 PROJECT CONSTRUCTION

3.10.1 Construction Access, Staging, and Environmental Protections

Construction access to the project site would be via the new Helios Access Road and Centennial Drive. Staging areas would be established within the approximately 6-acre project site on the terraces downslope of the building site. Staging areas would be fenced and enclosed. Environmentally Sensitive Area (ESA) fencing would be installed along the riparian areas and any other sensitive area to ensure that construction activities do not inadvertently affect these areas. The root systems of all large oak trees that

would not be removed in conjunction with the project but are in close proximity to project construction would also be protected by installing ESA fencing at the drip line, as required by the LBNL Construction Standards and Design Requirements.

The project would apply for coverage under the California National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity. In compliance with the permit process, the construction contractor would file a Notice of Intent with the State Water Resources Control Board, and a construction-phase Storm Water Pollution Prevention Plan (SWPPP) would be developed and implemented during project construction in order to avoid the discharge of pollutants into surface waters. The SWPPP will include storm water control Best Management Practices (BMPs) appropriate for construction activity on hillside locations.

3.10.2 Site Grading Activities

As a result of the project's hillside location, project construction would involve both cuts and fills. Based on the proposed design of the building, parking facilities and access road, the proposed project would require approximately 20,000 cubic yards (CY) of imported fill. Half of the required fill materials for the Helios project would be obtained from an on-site borrow area in the northeastern portion of the Berkeley Lab site (north of Buildings 74 and 84) that has approximately 10,000 CY of fill that could be transported to the project site, and half would be hauled to the site from off-site sources. Assuming a truck capacity of 12 CY, there would be approximately 833 truck trips between the borrow area and the project site as a result of the in-haul of fill. Haul trucks would travel on Calvin Road to access Lawrence Road, exit via the Strawberry Canyon gate to Centennial Drive, and then utilize the project access road to deliver the fill at the project site. About 10,000 CY of fill material from off-site sources in the Bay Area would be hauled to the site over a period of three months, resulting in a total of 833 truck trips or approximately 28 one-way daily truck trips along city roads, primarily University Avenue, Hearst Avenue, Gayley Road, and Centennial Drive.

Any groundwater encountered during project construction will be tested and then appropriately disposed either into the storm drain system or into the sanitary sewer system, or hauled off site for disposal.

3.10.3 Construction Traffic

Project construction activities would generate daily construction vehicle trips. There would be an average of 10 large delivery truck trips per day between April 2008 and April 2010 associated with the delivery of concrete, rebar, form work, structural steel, mechanical and electrical equipment, exterior siding and windows, drywall and studs, pipes and conduits, roofing materials, etc. In addition, as

described above for the first three months of construction, there would be an additional 15 truck trips per day associated with the delivery of fill material. On average, there would be 100 construction worker trips each day, and there would be from 10 to 50 small truck deliveries to the project site during the construction period. Therefore, there could be up to 10 large delivery truck trips, about 50 small delivery truck trips, and 100 construction worker vehicle trips to the site in one day. No construction truck traffic would be allowed to travel to and from the site during the commute hours.

3.10.4 Construction Schedule

Project construction is anticipated to begin in April/May 2008 and continue for approximately 26 to 34 months. Construction would take place Monday through Friday and would involve typical construction hours that extend from early morning through mid-afternoon.

3.11 2006 LRDP MITIGATION MEASURES

Because the proposed project is an element of the growth projected under the 2006 LRDP, mitigation measures adopted by The Regents in conjunction with the approval of the 2006 LRDP that are relevant to the proposed project have been included in and made part of the Helios project. The full text of the mitigation measures is provided in each resource section in **Section 4.0**. The analysis presented in **Section 4.0** evaluates environmental impacts that would result from project implementation following the application of the 2006 LRDP mitigation measures. These mitigation measures included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

3.12 PROJECT APPROVALS

Helios Facility will be an LBNL facility operated by the University of California and conducting work within the University's mission on land owned or controlled by the University. The Board of Regents is the University's decision-making body and is responsible for approving projects to be built on University-owned land. The Regents will review and consider this EIR in conjunction with the review and consideration of the Helios project.

This EIR will also provide information to other agencies with permitting or approval authority over the proposed project. Other potential approvals that the project may need include the following:

- An Authority to Construct and a Permit to Operate for the emergency generator included in the proposed project
- Coverage under the Statewide NPDES General Permit for Storm Water Discharges Associated with Construction Activity

- Section 404 Permit for placement of fill in jurisdictional waters
- Section 401 Water Quality Certification or Waiver
- In the unlikely event that the 2006 LRDP is set aside as a result of pending litigation challenging the 2006 LRDP EIR, then this EIR would serve as the environmental document for any required amendments to the 1987 LRDP, to the extent such amendments are needed for the Helios project.